Pure Air – Safe Diving !

Munich, 01.08.08

Highly pure breathing air is the elementary component in any diving equipment.

Since breathing air is concealed invisibly in diving cylinders and is therefore intangible, many divers and filling stations are often not aware that health and, as has now been shown on the Maldives, ultimately also life, depend on the quality of the inhaled air.

BAUER KOMPRESSOREN, as a market and technology leader in the area of breathing air generation, is aware of the enormous responsibility borne by the company in the manufacture of breathing air compressors and takes all conceivable measures to guarantee the highest degree of safety and quality in the breathing air produced:

All breathing air compressors from BAUER KOMPRESSOREN have been equipped for decades with tried and tested filter systems (TRIPLEX , P-filter systems), which satisfy the very strict limit values in DIN EN 12021 and exceed these substantially in some cases.
The SECURUS filter monitor from BAUER KOMPRESSOREN is the only device throughout the world that permanently monitors the stand time of filter cartridges by measurement using a sensor inside the filter cartridge, thereby warning in good time of filter cartridge saturation and shutting down the system. And this is 100% reliable; a new sensor is contained in every cartridge that is always innovative compared to the competition and that shuts down the compressor in the case of any sensor defect. By contrast, rival companies use questionable sensors which need to be recalibrated at great expense at short intervals and whose measurement reliability cannot be checked to say nothing of shutting down the compressor in the case of danger.
The active carbon bed in the cartridge that filters out substances such as oil and other pollutants provides a safety reserve that extends far beyond the saturation limits of the cartridge.

In the case of compressors operated with combustion engines or in environments that could contain exhaust gases from combustion engines, an intake of contaminated air is to be avoided where at all

possible (see information on erection / laying of intake system below). If this cannot be completely avoided, BAUER KOMPRESSOREN has developed filter cartridges with a special catalyst that converts the toxic carbon monoxide (CO) into safe CO2.
BAUER KOMPRESSOREN is the only manufacturer in the world to award compressor operators a PURE AIR certificate who operate their systems with permanent SECURUS filter monitoring and who subject themselves to an annual air test of the system. Here, the compressed air is checked with a highly sensitive air measuring device and a protocol with the measured values sent to the Quality Assurance Department at BAUER KOMPRESSOREN who check the compliance with the limit values and issue an annual seal.
The extensive documentation enclosed with every system addresses all safety aspects such as correct erection and the safe operation of the system. BAUER KOMPRESSOREN also offers a broad base training program in its own plant and through its partners which prepares interested course participants for the safe and responsible operation and maintenance of the system.

Conclusion: if systems are operated correctly a danger to life and limb as a result of poor breathing air quality can be ruled out.

The tragic diving accident on the Maldives demonstrates by way of example and in all clarity how the worst case, namely the death of a diver and severe injure to a further nine divers can arise due to sloppy and profit-oriented operation of systems together with the poor training of base personnel and complete failure to take any conceivable safety precautions:
The investigations of the Maldives police have not yet been completed. However, according to all information gathered so far, the following sequence of events can be viewed to be verified:
In the days before the accident several trips were made with a diving boat ‘baani adventurer’ from the operator ‘Touring Maledives’ on which the accident took place on 28 May 2008. Some of the participants complained about headaches after the diving trips.
Several systems were located on board from different manufacturers which were all operated by combustion engines.
A few days before the accident the drive motor of the make HONDA failed in one of the compressors. A motor mechanic trained to service the HONDA motor examined the motor and determined that due to lack of servicing and oil the machine was a total write-off. In this connection he also inspected the air intake filter of the compressor and determined that this was totally coked. Normally, the paper lamella of the filter turn grey during normal use as a result of the airborne particles until the filter is clogged and must be replaced.

However, the massive coking of the system could not have arisen by normal air pollution. Rather, it was attributable to the intake of soot particles from exhaust gases (to a substantial extent judging by the degree of carbonisation of the air filter) which came from the ship's diesel and / or combustion exhaust gases from other compressors.
If compressors are operated with compressor motor, the air must be taken in such that it is not burdened by combustion exhaust gases. This is either achieved by an intake telescope or an intake hose in which the opening must be positioned accordingly.
Photos taken after the accident also show that the intake hoses were defective and had been patched up at numerous places using adhesive tape. The ends of the hoses and the faulty hose sections were also located in the exhaust gas flow of the combustion engines of other compressors and of the ship's engine. Unconfirmed reports of participants also state that the intake hoses were not even connected to the compressor.

Operator failure 1:
the intake air was burdened to a high degree with a potentially toxic carbon monoxide and carbon dioxide due to poorly serviced systems and incorrectly positioned, defective hoses.
Investigations of the Maldives Police showed that, contrary to the clear instructions in the operating manual of the system, the wrong filter cartridge type was used. Instead of the filter cartridge for compressors with combustion engine whose additional catalytic converter neutralises carbon monoxide, a filter cartridge was used that is only approved for systems with emission-free electrical drive.
It is pure speculation whether this was negligence or a saving measure. According to the information of local experts on the scene, approx. 90 % of all cartridges purchased, assuming that the cartridges have not been incorrectly filled by the operators themselves, are cartridges that have only been approved for the operation with electrical motors, although a high percentage of the systems on the Maldives are operated with combustion engines. The high price of filter cartridges is supposed as reason (due to the expensive CO catalyst material). The fact that no such accidents have happened before on the Maldives is a pure stroke of luck under consideration of the framework conditions outlined above.
The air measurements made after the accident with respect to the confiscated breathing air cylinders of the divers in the accident also show high levels of CO such that the test tubes used completely shattered. The maximum measurement range is 150 ppm CO. The admissible upper limit of 15 ppm CO is below the maximum range of 150 ppm that can be measured and shown by the test tube by a factor of 10. This means that the CO burden in the air of the dead diver must have been at least 10 times the admissible limit value.

In all other divers the burden was an average of 80 ppm, i.e. 5 to 6 times the admissible upper limit value.

Operator failure 2:
as a result of using the wrong filter cartridge the CO polluted intake air was able to flow unimpeded into the diving cylinder and lead to the death of or injury to the divers concerned due to the breathing in of air highly polluted with CO / CO_2.

How can such accidents be avoided in future?

In the design, production and more (specialised servicing, original spare parts available quickly throughout the world, training, certification of compressor operators with the PURE AIR certificate) BAUER KOMPRESSOREN takes all conceivable measures to secure the generation of highly pure breathing air that is better than required by the DIN EN 12021 standard.
The possibilities of exerting influence stop when, as happened on the Maldives, the black sheep amongst the operators flaunt elementary safety requirements due to a lack of technical skill, for reasons of sloppiness and/or economy.
This problem can only be solved by the diligence of travel operators, technical publications and not least the sensitised and informed end customers, the divers, exercising pressure on shady operators to stop the dangerous handling of breathing air. For travel operators this is a duty under the new leading judgement of the Federal Court of Justice from 2007 on travel law (which placed strict supervisory duties on the operators to inspect partners at the destinations) in order to avoid own liability.
The end consumer, the visitor to the diving base, has only limited possibilities to assess the air quality in the absence of an air meter. But he has the right to perfect equipment, the most important component of which is pure breathing air. And through attentiveness and targeted questions to the travel operator and/or to the dive base operator at the destination he can, as customer, exercise the requisite pressure to compel shady operators to change their behaviour for fear of losing customers.

The following aspects may be used to assess air quality:

-Questions concerning the original filter cartridges in stock and the intervals of change. (Self fillers!). Respectable operators conduct a log

book on the change of cartridges and have a permanent filter monitoring system such as SECURUS. Be stubborn and do not be fobbed off by generalised statements!

-Is the compressor in a airless corner somewhere on the bottom of the ship? If this is the case, is the compressor taking in fresh air and where do the intake hoses end?

–Does the filling system and the filling area make a clean, well serviced impression (does not say everything but is an indication)?

-If headaches occur after diving which cannot be otherwise explained or if the air tastes poor or of oil - alarm bells!!

–Does the operator offer diving at unusually low prices. The competition amongst diving schools is extremely tough in some places. Savings are then not seldom made where they cannot be seen, for example, in servicing and consumables for compressors. Quality is seldom to be had at a discount.

In view of this tragic and unavoidable diving accident BAUER KOMPRESSOREN will step us its efforts to inform operators and end consumers and push ahead with the certification of diving bases in accordance with the BAUER PURE AIR standard.

Contact:

Ralf Deichelmann, Sales Promotion

Phone. ++49 89 780 49 -125 / Fax -167
e-mail r.deichelmann@bauer-kompressoren.de

BAUER KOMPRESSOREN GMBH
Drygalski-Allee 37 81477 München